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Getting Older Ones' Feet Wet: Older Adults' Adoption Intention of Gerontechnology of Mobile Bathtubs

(Full Paper)

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ABSTRACT

Global aging has led to increasing concern for the health and well-being of older adults. Family members generally care for older adults' needs, yet current trends suggest more independent lifestyles for older adults. Therefore, a better understanding of older adults' adoption intention of new gerontechnology is needed. This study adopts a two-stage approach (focus group discussions and survey research) to examine the factors of older adults' adoption intention of gerontechnology namely, mobile bathtubs. The findings show that perceived ease of use and perceived usefulness, along with specific design features of mobile bathtub were determinants of adoption intention among older adults.

Keywords: Mobile bathtubs, technology acceptance model, gerontechnology, older adults.

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INTRODUCTION

Demographic shifts in population aging have become a major cause for concern, caused by factors such as the rise in life expectancy rates at birth. This has resulted in an increased proportion of older adults aged 60 years or over to higher levels. The global population aged 60 years or over was reported at 962 million in 2017, more than doubling the figure reported in 1980 at only 382 million (United Nations Department of Economic and Social Affairs (UN DESA) Population Division, 2017, p.1). Interestingly, two thirds of the world's older persons are living in developing regions, e.g., such as Thailand and Malaysia, where their numbers are outpacing those in developed regions (UN DESA Population Division, 2017, p.1). Such a drastic demographic shift holds far-reaching implications for not just older adults themselves, but also for the remainder of the world's population, due to increases in the duty of caring for the older population. Therefore, new avenues are needed to successfully address the issues that come about with rising numbers of older adults worldwide.

One of the strategic approaches to this issue is through Gerontechnology, an emerging multidisciplinary field of research that aims to improve the daily functioning of older adults (Bouma & Graafmans, 1992, p.1-5). Gerontechnology enables the sustainability of an aging society by means of technology that helps older adults to enjoy a better quality of life (Van Bronswijk, Bouma, & Fozard, 2002), through combining both elements of gerontology and technology (Fozard *et al.*, 2000). Gerontechnology also highlights the potential behind the use of technology to bring about benefits to both aging and aged people (Chen & Chan, 2011; Fozard, 2005). This positions gerontechnology as a vital field of study in supporting older adults to move forward. Recent studies (Joseph *et al.*, 2016; Teh *et al.*, 2016) have explored the way older adults adopt new assistive technologies that aim to improve their daily quality of life. Therefore, this study examines one type of assistive technology: mobile bathtubs. This study focuses on the act of bathing, with the primary aim of helping older adults overcome physical limitations to independently and confidently bathe.

A two-stage approach (i.e., focus group discussion and survey research) was used to assess the perceptions and acceptance of older adults on mobile bathtubs. First, focus group discussions were undertaken to draw out the key insights on bathing, the use of bathtubs and the design of Plaxibath and Rotobath. Plaxibath and Rotobath developed by iMagic-BOX were specifically used as examples of mobile bathtubs due to their relative contemporary design, whose features were targeted towards older adults. Second, this study drew upon the Technology Acceptance Model (TAM) to examine the older adults' perceived ease of use and perceived usefulness, along with their attitudes towards specific design features of the Plaxibath & Rotobath.

LITERATURE REVIEW

A. The Loss of Independence in Late Life

A common issue as part of aging for the average older adult is related to mobility (Webber, Porter, & Menec, 2010). While much of the problems brought about by a decrease in mobility only rarely impede the quality of life of the average older adult, the question of healthcare and independent living comes to light. There exists a rising trend of older adults wanting to live independently, and this brings about various socio-cultural implications (UN DESA Population Division, 2017, p.1), such as the

likely decline in demand for nursing/old folks' homes in the coming future. Additionally, in the United States of America, the Association of American Medical Colleges (2017) declared shortages of the supply and demand of physicians to provide medical care for all the facilities across the nation, with nurses in the country facing similar issues (American Association of Colleges of Nursing, 2017). As for developing regions, most nations are ill-prepared for the incoming reality of this demographic shift, leading to makeshift, short-term solutions. Malaysia for instance, is plagued with some nursing/retirement homes operating without proper infrastructure (Abdullah & Lee, 2011).

Faced with limited options, it is often the case that for these older adults that as time progresses, it becomes increasingly likely that they will finally be unable to fully care for themselves. Many will either be unable to afford or simply prefer not to opt for homecare services, so the duty of care usually falls to the rest of the family. Unfortunately, as family members have their own lives to lead and commitments to their own nuclear families, providing care for the family's older adult(s) is understandably, either not possible or simply ineffective in most circumstances. As a direct result, family members can rarely devote themselves fully to caring for their old, thus in most situations family support can never truly be full-time support if the situation warrants.

B. The Issue of Bathing in Late Life

Faced with this situation, many older adults must negotiate basic, everyday activities independently despite their ever-increasing physical limitation. Focusing on long-term care, bathing quickly turns into one of the commonplace activities that becomes increasingly unfeasible to carry out independently. The Centers for Disease Control and Prevention (2011) identified that in the United States of America in 2008, approximately 21.8 million persons aged 15 years or above were involved in non-fatal, unintentional injuries, incurring approximately $67.3 billion in lifetime medical costs with injury rates increasing with age, and coincidentally, most injuries in the washroom (81.1%) were caused by falls. Alternatively, Bagga *et al*. (2013) posits that in the United States of America from 2002 to 2010, amongst product related adult genitourinary injuries treated at emergency departments, injuries sustained in the bathroom were quite common. Altogether, bathroom fixtures and bathing products together accounted for 10.4% of such injuries, most often in the form of falls.

While these reports do not focus purely on accidents occurring during bathing, and do not make mention of whether these accidents occurred with or without assistance of a caretaker, there is sufficient cause for precaution- a combination of wet surfaces and movement difficulties usually results in unfortunate accidents. Hence, there is a great need for better understanding how older adults would perceive gerontechnologies that may assist them in this area. This paper focuses on one such innovation, mobile bathtubs, a rather novel solution—one that is relatively unexplored academically—that could potentially aid older adults in the act of bathing.

C. TAM and Hypothesis Development

TAM is regarded as an established model in understanding technology adoption behavior (Lim, 2018). TAM purports that adoption behavior is decided by the intention to use a particular system, which is consequently determined by perceived usefulness and perceived ease of use of the system (Lim, 2018). As such, TAM serves as an appropriate framework for understanding the effects of external variables on system adoption (Hong *et al.*, 2001), this paper seeks to empirically determine that such variables as perceived ease of use and perceived usefulness have significant positive effects on older adults' adoption behaviour of mobile bathtubs.

Davis (1989, p.320) described perceived ease of use as "the degree to which a person believes that using a particular system would be free of efforts," whereas perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance." While Turner *et al.* (2010, p.471) reminds that "the TAM is not the end point of technology introduction," for the purposes of this study, the focus is more on adoption intention, which allows greater understanding of what features a mobile bathtub would need to possess to appear attractive to Malaysian older adults as buyers/users. As previously mentioned, mobile bathtubs can be viewed as gerontechnologies that focus on improving older adults' experience of bathing, by emphasizing user safety and value-added features not found in regular bathtubs. Thus, in this study, perceived ease of use is an individual older adult's evaluation of how straightforward and simple a mobile bathtub like the Plaxibath and Rotobath are to use, whereas perceived usefulness is their evaluation of the utility provided by them. In essence, if a mobile bathtub is difficult or complicated to use, as well as not providing sufficient utility, its use would be avoided. Past studies (Segars & Grover, 1993; Gefen, Karahanna, & Straub, 2003; Hung, Lai, & Chang, 2011) provide supporting evidence of the significant positive effect of perceived ease of use on behavioral intention. Hence, there exists a strong likelihood that this positive effect extends to adoption intention as well. With TAM as a basis, we hypothesize that perceived ease of use and perceived usefulness of Plaxibath and Rotobath respectively will have a positive effect on adoption intention to use them. Therefore, we propose the following hypotheses:

H1: Perceived ease of use will have a positive effect on adoption intention of Plaxibath.
H2: Perceived usefulness will have a positive effect on adoption intention of Plaxibath.
H3: Perceived ease of use will have a positive effect on adoption intention of Rotobath.
H4: Perceived usefulness will have a positive effect on adoption intention of Rotobath.

In addition, an interesting phenomenon with regards to drivers of intentions and innovation adoption behavior is that consumers tend to display higher levels of adoption intention for innovations that are more complex, even though consumers generally adopt innovations with less complexity (Arts, Frambach, & Bijmolt, 2011). That considered, as this study merely focuses on the intention stage of technology acceptance and adoption, we hypothesize that certain specifically innovative design features of the Plaxibath and Rotobath would prompt a positive effect on adoption intention of them. For the Plaxibath, a drawbridge that lowers to form a ramp into the bathtub, which then closes to seal the entrance keeping it watertight. It also utilizes a safety harness to restrain the user for their own safety, preventing falls altogether during the actual bath/shower. As for the Rotobath, the bathtub would rotate on its vertical axis, allowing the user to walk into the bathtub, then it would lower itself to a lying position, and the user with it. The Rotobath also comes with the same safety restraints as the Plaxibath. Hence, we propose the following hypotheses:

H5: Attitude towards Drawbridge Design feature of Plaxibath will have a positive effect on adoption intention of Plaxibath.
H6: Attitude towards Safety Restraint Device feature of Plaxibath will have a positive effect on adoption intention of Plaxibath.
H7: Attitude towards Rotation Design feature of Rotobath will have a positive effect on adoption intention of Rotobath.
H8: Attitude towards Safety Restraint Device feature of Rotobath will have a positive effect on adoption intention of Rotobath.

METHODOLOGY

A. Focus Group Discussion, Survey Instruments and Study Design

The first stage of the study involved focus group discussions with 12 older adults (i.e. people older than 55 years of age) living in Malaysia. Informed consent was obtained from all 12 participants. The discussions were audio-recorded. As per Monash University Malaysia ethics guidelines, respondents can choose to withdraw from the focus group discussions at any time they wish should they feel uncomfortable in continuing with the focus group discussions. All focus group discussions were closely monitored by the lead researcher to ensure quality and consistency.

During the second stage of the study, a survey research was undertaken using a set of questionnaires which includes two sections: (1) Plaxibath; and (2) Rotobath. Thirty-seven older adults completed the Plaxibath questionnaire, and 36 of the same older adults completed the Rotobath questionnaire. All 37 participants are 55 years old or above living in Malaysia. The survey questionnaires included questions on demographic characteristics, attitudes towards the Plaxibath's and Rotobath's respective perceived ease of use, perceived usefulness, and specific design features. For this study, five constructs were measured and analyzed: (1) Perceived ease of use; (2) Perceived usefulness; (3) Attitude towards Safety Restraint Device feature; (4) Attitude towards specific design feature of each mobile bathtub, i.e., Plaxibath's Drawbridge Design & Rotobath's Rotation Design features respectively; and (5) Adoption Intention. There was a total of 19 items for the Plaxibath questionnaire and 21 items for the Rotobath questionnaire. Among these items, some items were adapted from an instrument developed in previous studies (Joseph *et al.*, 2016; Teh *et al.*, 2016) and some new items were introduced to measure the design features (e.g., "I like the idea of using the Rotobath"). The items were measured on a seven-point Likert scale (i.e. "1" = "strongly disagree" and "7" = "strongly agree").

DATA ANALYSIS AND RESULTS

A. Data Analysis of Focus Group Discussions

The audio taped data of focus group discussions were transcribed verbatim and analyzed using content analysis. First, all transcriptions were read carefully. Data were clustered together similar topics (e.g., bathing, Plaxibath mobile bathtub and Rotobath mobile bathtub). Several codes were developed for each topic.

B. Content Analysis

Bathing

1. *Importance of bathing* – All the 12 participants found bathing an important daily activity or a survival activity especially in the Malaysian tropical weather. Bathing to these participants was to clean themselves, a matter of hygiene, feel refreshed and comfortable.

2. *Method of bathing* – Bathing methods and habits differ with climate, geographical location (village or cities), and lifestyle. The pail and dipper ('gayung'), a traditional method of bathing apart from bathing at the waterfalls is still common in Malaysia. It was common to find concrete troughs of clean water (which eventually replaced the pail) from which clean water is scooped with a plastic dipper in bathrooms. Later due to western influence, long bathtubs and showers were introduced in Malaysia.

3. *Pail and dipper* – Among the participants, 17 percent mentioned that they still use the pail and dipper or bathe at the waterfalls when they returned to their hometowns/villages in a more rural setting compared to Klang Valley.

4. *Shower* – All participants currently used the shower as a method of bathing.

5. *Use of bathtubs* – All the respondents were not keen on using bathtubs as they were not culturally used to soaking in a bathtub. It is more of a western influence. The use of the bathtub was introduced during the British period as indicated by a 62-year-old male participant. For participants who have a shower unit and the bathtub, it is common to use the shower instead of the bathtub. Participants who have remodeled their bathrooms have removed the bathtubs. They considered it a waste of time and resources like water. A 71-year-old participant mentioned that his family member with bathing disabilities was reluctant to use the bathtub.

6. *Post bath cleaning of bathtubs* – After a bath, cleaning the bathtub was an additional task. This was indicated by 25 percent of the participants. If this was not done, there would be soap scum and grime left in the tub.

7. *Fear of falling (change in functional ability)* – All the participants expressed a need to feel safe when bathing. Extrinsic fall risks like a slippery floor after using soap or the lack of a grab bar was a concern for a few of the participants. Another participant mentioned that intrinsic factors like body imbalance has been an issue.

8. *Anticipation of bathing disability* – In anticipation of future bathing disability our participants have made changes or remodeled their bathrooms for themselves or their loved ones as they are caregivers. To them this is a phenomenon that is inevitable as they age. Water temperature adjustments when using a pail and dipper was an area of concern. Slip resistant mats were used by 17 percent of the participants. However, 33 percent of the participants found it difficult to clean the mould and grime off these mats and discontinued using them or did not use them at all. Other than mats, another participant was in favor of anti-slip tiles. A 71-year-old male focus group member raised the issue of the curved areas inside the tub which may be slippery and of danger to older adults. 17 percent of the participants had remodeled their bathrooms, removed the bathtub and installed a walk-in shower.

Plaxibath Mobile Bathtub

1. *Useful in nursing homes* – This mobile bath is useful in nursing homes for those who have mobility issues and are unable to walk due to a stroke as indicated by 50 percent of the respondents. A male, 65-year-old respondent mentioned that residents with restricted mobility are given a sponge bath in the old folks' homes. To these individuals, the Plaxibath would encourage or instill the willingness to shower.

2. *Useful for people with restricted movements* – Fifty-eight percent of the participants indicated that the Plaxibath will be useful for those with restricted movements. Two male participants aged 65 and 73 respectively, indicated that it would be useful for their loved ones due to their physical condition. They can have a proper bath using this mobile bathtub. Another concurred that it would also be useful for those who are paralyzed. In fact, it would be convenient for those who are immobile. A 65-year-old male respondent posited that it is not about independence but an assistive device that would allow the individual to have a bath that would make the person comfortable. The participants believed that this device would ease the burden of the caregiver. Twenty-five percent of the participants mentioned that the Plaxibath can be used as an alternative to carry their loved one to the bathroom for a shower. Some participants felt that this mobile bath may not indicate independence at their stage in life but for their loved ones under their care. In fact, two of the participants mentioned that this assistive technology will reduce anxiety.

3. *Cost* – 67 percent of the focus group respondents were concerned about the cost of the Plaxibath and Rotobath. They estimated the cost of the mobile baths to be between RM5,000 to RM10,000 for the Plaxibath and approximately RM10,000 for the Rotobath. One of the focus group members, a 65-year-old male would opt for a simpler substitute of bathing his loved one, if it is above RM5,000. A 71-year-old male participant supported this suggestion. Another respondent, a 75-year-old male pointed out that using a shower would be less expensive. In this case, cost will be an economic factor affecting technology acceptance and adoption.

4. *Design considerations (Spacious constraint)* – A 65-year-old -male participant asserted that the reality of modern living environment is space constraint. About 75 percent of the participants were concerned about the space in the mobile baths to maneuver the wheelchair. Wheelchairs come in different sizes. The participants were wondering as to whether the Plaxibath was spacious enough for wheelchairs. A 73-year-old respondent who is also a caregiver was concerned as to how this mobile bath would be useful for his mother with very restricted movements and who requires the assistance of two caregivers. Due to spacious constraint, a 66-year-old female participant indicated that when an older adult is being wheeled into the mobile bath, the older adult will be facing the wall & gadgets in the Plaxibath. There is no room to turn the wheelchair around. A 71-year-old participant, who is also a caregiver, indicated that he did not see the need of a wheelchair for the Plaxibath. If he could wheel himself into the Plaxibath, then he could wheel himself into his bathroom at home with the existing shower facility. In short, there is no need for the Plaxibath.

5. *Design considerations (Communication device)* – A 66-year-old respondent indicated that the communication device is helpful in the event of an emergency. However, another respondent (73-year-old caregiver) disagreed with him as in his mother's case, with two caregivers assisting her and this would be unnecessary. In place of the communication device, he would prefer a RM1000 reduction in the cost of the mobile bathtub. On the other hand, another respondent feared for the safety (being electrocuted) of the older adult using the communication device while bathing in the mobile bath.

6. *Design considerations (Hot air feature)* – The 'hot air' feature is deemed unnecessary in our tropical weather. The danger of the hot water pipes being overheated is a cause for concern for a 71-year-old male respondent.

7. *Design considerations (Safety)* –The overall safety in terms of electrical malfunction of the unit was raised by 42 percent of the participants. As mentioned in the earlier sections (communication device and 'hot air' features), respondents feared being electrocuted while bathing. One respondent cited reports of deaths while showering.

8. *Design considerations (Feeling claustrophobic)* – A participant indicated that older adults like his father are not happy to go into enclosed or small areas.

9. *Design considerations (Water level)* – There was a concern among the participants as to whether the water level could be adjusted according to the height of the individual. A 65-year-old male participant was concerned about the water level being below the human heart level due to medical reasons.

10. *Design considerations (Recycled water)* – The cleanliness of the recycled water was an area of concern for 67 percent of the participants. The issues raised were whether the water will be clear or cloudy and whether it would be free of bacteria after recycling. One of the participants, a 65-year-old male, was curious as to whether chlorine was used to kill the bacteria in the water while another participant indicated that only a membrane was used, and the water may not be clean.

11. *Design considerations (Special wheelchairs for the mobile unit)* – Three participants were curious if a special waterproof wheelchair would be provided for this mobile unit as the existing wheelchair of the older adult may not be suitable as it may be soiled or damaged.

12. *Design considerations (Maintenance)* – Another cause for concern was the regular maintenance of the mobile bath unit. A 64-year-old male participant was concerned about length of the warranty period. The malfunction or the regular servicing of the mobile bath unit is complicated compared to using a wheeled commode as highlighted by a 71-year-old participant. This notion was supported by three other members of the focus group.

13. *Design considerations (Mobility)* – Although it is claimed that both Plaxibath and Rotobath are mobile, they are not. The baths must be fixed in a position where there is a water inlet and outlet. Furthermore, a power source would be required. Thus, a 65-year-old male respondent mentioned that these units are not literally mobile.

Rotobath Mobile Bathtub

1. *Design considerations (Grab bars)* – The position of the grab bars provided are not ergonomically fitted as indicated by two of the participants. Fitting grab rails strategically was suggested.

2. *Design considerations (Sittings)* – Two participants raised their concern of the design of the seat in the Rotobath in terms of its weight and the overall weight of the Rotobath.

3. *Design considerations (Durable in appearance)* – Some participants indicated that one of the advantages of the Rotobath is its durable (solid) outward appearance.

4. *Design considerations (Medicated water)* – One participant suggested the use of medicated water for the Rotobath.

5. *Design considerations (Convenience)* – Most of the participants posited that the Rotobath is useful for those with restricted mobility and this unit enables a caregiver to assist the older adult.

6. *Design considerations (Cleanliness)* – A 73-year-old male respondent raised an issue of the difficulty of cleaning the body (back) of an older adult while soaking in a reclining position in the Rotobath.

7. *Design considerations (Relaxing and flexible)* – The Rotobath would be more relaxing for an older adult. This was a sentiment shared by 25 percent of the participants. If an older adult was not comfortable to recline and shower, then there is a choice of being in a raised position.

8. *Design considerations (Shower)* – One of the participants, a 65-year-old male, raised the issue as to whether it was possible to shower in the Rotobath in a seated position. However, a 64-year-old male participant, added that there was no shower unit in the mobile unit.

9. *Technology acceptance* – A 62-year-old female participant indicated that this product can be introduced to older adults, but she is not sure as to whether they will accept new technology. Her view is that safety of the bathtubs would be their concern.

C. Data Analysis of Survey Research

The findings of focus group discussions provided the basis for the development of the questionnaires. A total of 37 older adults participated in the survey research. Twenty-one participants were female (56.8%) and 16 participants were male (43.2%). Ten participants were between 55 and 64 years old (27%), 14 participants were between 65 and 74 years old (37.8%), 11 participants were between 75 and 84 years old (29.7%), and two participants were more than 85 years old (5.4%).

Reliability and validity of the survey instrument were assessed using Cronbach's Alpha (CA) and Average Variance Extracted (AVE) (see Tables 1 & 2). All CA values of both Plaxibath's & Rotobath's scales were greater than 0.70, providing a strong evidence of reliability. Discriminant validity was validated as all the square roots of AVE values were greater than the off-diagonal values in the correlation matrix.

Multiple regression analysis was performed (see Figs. 1 & 2). Perceived ease of use of Plaxibath (β=0.224; p-value<0.05) and perceived usefulness of Plaxibath (β=0.769; p-value<0.001) were positively related to adoption intention of Plaxibath. Perceived usefulness of Rotobath (β=0.531; p-value<0.01) was also positively related to adoption intention of Rotobath. However, perceived ease of use-intention relationship for Rotobath (β=0.267; p-value>0.05) was non-significant. Furthermore, attitudes towards drawbridge design feature of Plaxibath (β=0.336; p-value<0.05) and attitudes towards safety restraint device feature of Plaxibath (β=0.445; p-value<0.01) were positively related to adoption intention of Plaxibath. Attitudes towards rotation design feature of Rotobath (β=0.567; p-value<0.001) and attitudes towards safety restraint device feature of Rotobath (β=0.345; p-value<0.01) were positively related to adoption intention of Rotobath.

Table 1: Reliability and Validity Analysis for Plaxibath

	PUP	PEP	DDP	SRDP	AIP
PUP	***0.907***				
PEP	0.234	***0.846***			
DDP	0.562**	0.189	***0.836***		
SRDP	0.522**	0.12	0.495**	***0.883***	
AIP	0.821**	0.404*	0.556**	0.611**	***0.972***
CA	0.924	0.748	0.782	0.882	0.968
CR	0.965	0.881	0.867	0.934	0.981
AVE	0.822	0.715	0.698	0.780	0.944
ME	4.932	5.405	5.505	5.101	4.342
SD	1.339	0.882	0.776	1.200	1.749

Note: PUP=Perceived Usefulness of Plaxibath; PEP=Perceived Ease of Use of Plaxibath; DDP=Attitude towards Drawbridge Design feature of Plaxibath; SRDP=Attitude towards Safety Restraint Device feature of Plaxibath; AIP=Adoption Intention of Plaxibath; CA=Cronbach's Alpha; CR=Composite Reliability; AVE=Average Variance Extracted; ME=Mean; SD=Standard Deviation; ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Values in both bold and italic are square roots of the Average Variance Extracted.

Table 2: Reliability and Validity Analysis for Rotobath

	PUR	PER	RDR	SRDR	AIR
PUR	***0.888***				
PER	0.583**	***0.939***			
RDR	0.679**	0.486**	***0.824***		
SRDR	0.431**	0.355**	0.268	***0.889***	
AIR	0.687**	0.577*	0.659**	0.497**	***0.943***
CA	0.954	0.929	0.878	0.892	0.937
CR	0.957	0.957	0.913	0.936	0.960
AVE	0.789	0.882	0.680	0.789	0.889
ME	4.403	5.148	4.172	5.160	3.639
SD	1.481	1.172	1.245	1.293	1.612

Note: PUR=Perceived Usefulness of Rotobath; PER=Perceived Ease of Use of Rotobath; RDR=Attitude towards Rotating Design feature of Rotobath; SRDR=Attitude towards Safety Restraint Device feature of Rotobath; AIR=Adoption Intention of Rotobath; CA=Cronbach's Alpha; CR=Composite Reliability; AVE=Average Variance Extracted; ME=Mean; SD=Standard Deviation; ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Values in both bold and italic are square roots of the Average Variance Extracted.

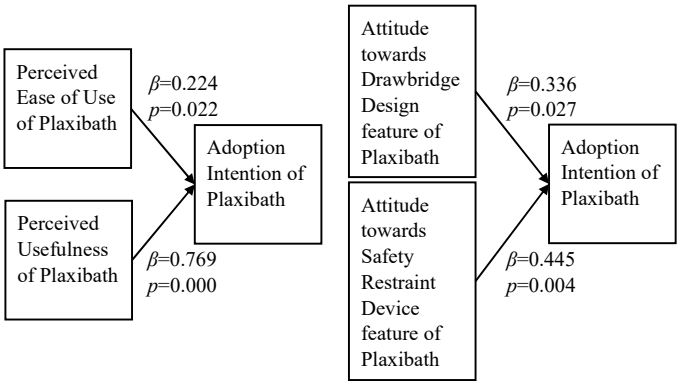

Figure 1: Results of Regression Analysis for Plaxibath (n=37)

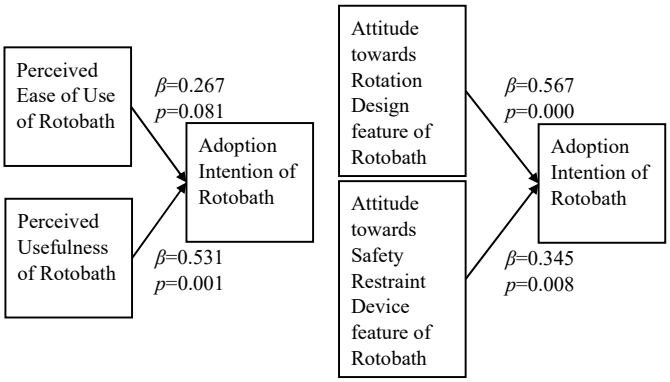

Figure 2: Results of Regression Analysis for Rotobath (n=36)

DISCUSSION

The findings of the focus group discussions highlighted many of the specifics of the PlaxiBath and Rotobath design components, often in conjunction to the Malaysian context. Regarding the Malaysian context, cultural aspects such as traditional bathing methods, climate concerns, bathing habits, economic factors, etc. were treated as important factors when considering mobile bathtubs. In addition, unsurprisingly, physical and medical safety was a recurring topic during the discussions and was given particularly special focus across the various features of the mobile bathtubs. In other words, the Malaysian context and safety were a constant priority to the Malaysian older adults engaged in the discussion. As such additional attention ought to be given to these considerations when designing mobile bathtubs (and possibly regular bathtubs as well).

The results of the quantitative analysis supported all hypotheses (H1 through H8) except H3. Specifically, the findings displayed that perceived ease of use and perceived usefulness, along with specific design features of the Plaxibath and Rotobath were clear determinants of adoption intention for them. Interestingly, a non-significant perceived ease of use-adoption intention relationship for Rotobath was found. One possible explanation is the degree to which using Rotobath is perceived as being difficult to use. Generally, ease of use more strongly inhibits behavior than intention, however ease of use's effect on intention can be a positive one, as perhaps prior to adoption, consumers underestimate the (potentially negative) role of complexity and are overconfident about the usability of the innovation (Arts, Frambach, & Bijmolt, 2011).

CONCLUSION

This paper contributes to a better understanding of older adults' adoption intention of mobile bathtubs built upon TAM, as well as practicality, for engineers/inventors by highlighting design features that older adults prioritize. Gerontechnology can serve a vital function in enhancing the quality of life of an aging population. With that in mind, from a practical standpoint, this study highlights the importance of ease of use, usefulness, and key design features in determining adoption intention of older adults for mobile bathtubs. While inventors/innovators seek to design technology-based products facilitating and enhancing wellbeing among older adults, focus on catering to potential users must also exist. This attention to both efficient design as well as understanding what attracts users to adopt new technologies is therefore vital to the adoption and widespread use of said new technology.

This study has two research limitations. First, the sample size was relatively small (n=37) in this study. Future research should increase the sample size in their data collection. Second, the older adults recruited in this study were Asians and the findings could differ with diverse ethnic groups. In future, this study should be replicated across groups of different ethnicities and cultural backgrounds.

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